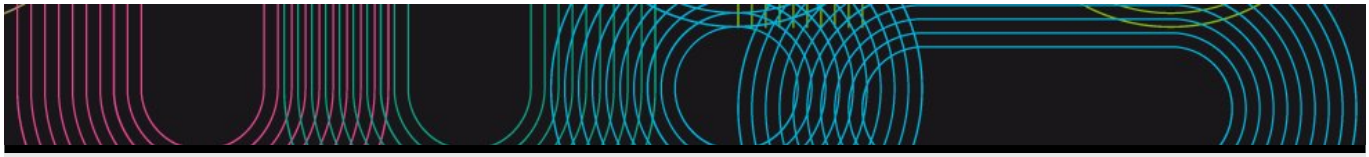

IDENTIFYING DATA				
Principles of Digital Communications				
Subject	Principles of Digital Communications			
Code	V05G300V01613			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	González Prelcic, Nuria			
Lecturers	Comesaña Alfaro, Pedro González Prelcic, Nuria Márquez Flórez, Óscar Willian			
E-mail	nuria@gts.tsc.uvigo.es			
Web	http://faitic.uvigo.es			
General description	The basic aims of the subject are the following: - Apply optimisation criteria for the realisation of diagrams of estimate and synchronisation in digital receptors of communications. - Differentiate the blocks and the functionalities of a data transmission system. - Use digital signal processing to transmit and receive analog waveforms. - Apply the basic mechanisms of reduction of the impact of noise in a communications system.			

Competencies	
Code	
B3	CG3: The knowledge of basic subjects and technologies that capacitates the student to learn new methods and technologies, as well as to give him great versatility to confront and update to new situations
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
B11	CG11 To approach a new problem considering first the essential and then the secondary aspects
C26	CE26/ST6 The ability to analyze, codify, process and transmit multimedia information using analogical and digital signal processing techniques.
D2	CT2 Understanding Engineering within a framework of sustainable development.
D3	CT3 Awareness of the need for long-life training and continuous quality improvement, showing a flexible, open and ethical attitude toward different opinions and situations, particularly on non-discrimination based on sex, race or religion, as well as respect for fundamental rights, accessibility, etc.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Apply criteria of optimisation for the realisation of diagrams of estimate and synchronisation in digital receptors of communications	B3	C26	
Differentiate the blocks and the functionalities of a system of transmission of complex data	B11	C26	D2
Use the processed digital of signals to transmit and receive forms of analog wave	B3 B4		D3
Apply the basic mechanisms of reduction of the impact of noise in a system of communications		C26	D2

Contents
Topic

1. Introduction to the digital communications.	- The concept software irradiate. - Elements of a digital receptor. - Objective of quality of a digital system.
2. Clock recovery.	- Introduction to the problem. - Recovery guided by decisions. - Recovery no guided.
3. Carrier recovery.	- Known-frequency phase estimation. - Phase Locked Loops (PLL). Costas' loop. - Decision-aided phase estimation. - Carrier frequency estimation.
4. Channel equalization.	- Equivalent discrete channel. - Least Square (LS) equalizer. - Adaptive algorithms: trained, decision-aided, blind.
5. Channel coding.	- Information measure. Entropy. - Channel capacity. - Channel coding. Coding gain.

Planning

	Class hours	Hours outside the classroom	Total hours
Troubleshooting and / or exercises	4	12	16
Laboratory practises	12	36	48
Projects	7	35	42
Master Session	17	25	42
Long answer tests and development	2	0	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Troubleshooting and / or exercises	Some of the proposed problems for each topic will be solved in class. Through this methodology the competencies CG3, CG4, CG11, CE26 are developed.
Laboratory practises	The concepts presented in class will be further illustrated and developed by means of Matlab-based simulation and signal processing tools. Through this methodology the competencies CG4, CG11, CE26 are developed.
Projects	Development of a complete PAM and QAM modem in Matlab. Work in small groups. Through this methodology the competencies CG3, CG4, CG11, CE26, CT2, CT3 are developed.
Master Session	Presentation and discussion of the fundamental theory. Through this methodology the competencies CG4, CG11, CT2, CT3 are developed.

Personalized attention

Methodologies	Description
Master Session	Student aid will be provided during office hours as well as on-line (email, chat). On-line discussion forums will be set up for each chapter, through the usual e-learning platform.
Laboratory practises	Student aid will be provided during office hours as well as on-line (email, chat). On-line discussion forums will be set up for each chapter, through the usual e-learning platform.
Projects	Student aid will be provided during office hours as well as on-line (email, chat). On-line discussion forums will be set up for each chapter, through the usual e-learning platform.

Assessment

	Description	Qualification	Training and Learning Results		
Laboratory practises	Three short tests will be given during the semester	30	B3 B4	C26	D3
Projects	The project will be evaluated at the end of the semester.	30	B3 B4 B11	C26	D2 D3
Long answer tests and development	Final exam.	40	B3 B4 B11	C26	

Other comments on the Evaluation

For those students that choose continuous evaluation, the final mark will be obtained as:

Ntests+Nproject+Nexam

where, Ntests is the mark accumulated in the short tests, up to 3 points; Nproject is the mark of the practical project up to 3 points; and Nexam is the mark of the final exam up to 4 points. In order to pass the subject a student has to get at least 4 points over 10 in the exam; if that threshold were not achieved, the final mark will be that obtained at the exam, even if the student had chosen continuous evaluation.

For those students that do not choose continuous evaluation, the final mark will be the one obtained at the final exam.

The final exam will be the same for both kinds of evaluation; nevertheless, its weight in the final mark will be changed according to the student's choice of following, or not, continuous evaluation.

The student has to decide, after the realisation of the second short test, if he/she opts for continuous evaluation, or not; that decision must be communicated to the instructor in due time. The students that chose continuous evaluation and did not pass the subject would receive the "fail" qualification independently of doing the final exam, or not.

The continuous evaluation mark will be considered in July evaluation, but not for subsequent courses. In July evaluation the students that chose continuous evaluation can decide if they wish to keep the short tests and project mark, or if they prefer to be 100% assessed by the final exam.

Sources of information

C. R. Johnson Jr y W. A. Sethares, **Telecommunication breakdown: Concepts of communication transmitted via software-defined radio**,

J.R. Barry, E. A. Lee y D. G. Messerschmitt, **Digital communication,**, 3rd edition,

A. Artés Rodríguez, F. Pérez González y otros,, **Comunicaciones Digitales**,

Recommendations

Subjects that it is recommended to have taken before

Signal Transmission and Reception Techniques/V05G300V01404
Multimedia Signal Processing/V05G300V01513